REMOTE
MEASUREMENT
SYSTEMS, Inc.

P.O. BOX 15544
SEATTLE, WA 98115
TEL. (206) 525-3369

January 9, 1984

Dr. Larry Shoer
Department of Chemistry
Bates College
Lewiston, Maine 04240

Dear Dr. Shoer:

Thank you for your inquiry of September 26th concerning the ADC-1 data acquisition and control system. Please accept my apology for the delay in answering your letter. It was misplaced and only recently was discovered hiding behind the filing cabinet. I hope the enclosed information is still of interest to you.

Enclosed please find the most recent ADC-1 specification and retail price brochures. Though we offer no specific educational discounts, if you order more than one unit we can offer you the following OEM prices:

2 - 9	$285
10-99	$275
100+	$265

I have also enclosed a copy of our Owner's Manual which should explain in detail the capabilities and operation of the ADC-1. We currently have ADC-1's in stock so shipping time is about 3 days.

We currently are developing low cost (about $30 ea.) sensors for humidity, atmospheric pressure and ultrasonic motion detection to compliment our other sensors listed on our price list. Any electronics needed to run a sensor are included with that sensor, though most only require the ADC-1 with no other electronics. Occasionally you may need to add a capacitor across an input to reduce noise levels and some transduscers from other manufactures have analog output range different than the ADC-1 thus requiring a 2 or 3 resistor voltage divider. If you have a specific transducer which you would like us to prepare, please send us your requirements.

The ADC-1 is comprised of CMOS chips and requires only 10ma at 5 volts. Many sensors can be configured to draw a similar small current and thus the entire ADC-1/sensor package can draw its power from the host computer through diode protected RS-232 logic lines such as DTR and RTS. Batteries are also an easy-to-use power source. In a recent

Radio Shack
273-1454 adapter 6VDC at 150 ma $5.95
273-1455 adapter 9VDC at 300 ma $6.95

test, the ADC-1, 7 temperature sensors and 3 resistive networks ran for 190 hours (> 7 days) on three ordinary "D" cell flashlight batteries. The occassional sensor which draws more current such as a soil moisture probe can be powered from an external power supply.

Thank you again for your interest in the ADC-1 and do not hesitate to call if you have any questions.

Sincerely,

Keith Ronnholm

Keith B. Ronnholm
President

KBR/sds
Enclosures

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P.O. BOX 15544
SEATTLE, WA 98115
TEL. (206) 525-3369

September 11, 1984

Greetings:

Within the past year you requested and received information, or purchased the ADC-1 Data Acquisition and Control System from REMOTE MEASUREMENT SYSTEMS. Since that time, RMS has added several new products and expanded its base of successful applications. Some of the latest information from RMS may affect your present plans or open up new areas of interest for you.

As an RS-232 peripheral, the ADC-1 has now been coupled with a wide variety of computers. The list of computers for which we provide interconnection instructions and sample programs in Appendix A of our Owner's Manual now includes:

Apple II, MacIntosh	IBM PC, PCjr
Atari 400, 800	NEC PC-8201 Portable
Commodore VIC-20, C-64	Northstar Horizon
DEC Rainbow	Osborne 1, Executive
Epson HX-20, QX-10	Radio Shack Model IV, 2000
Hewlett Packard HP-71	Radio Shack Portable 100
Kaypro II, 4, 10	Victor 9000

Unfortunately, component prices and labor costs have increased in the past year and we must announce a new ADC-1 price effective October 1, 1984. The price of the ADC-1 will be raised to $395 - still an outstanding bargain. The good news is that there is time to order before then, for shipment at the current $369 price. We urge anyone considering a purchase in the near future to order before the first, to take advantage of the current price. Orders received with a check or money order will qualify for a 2% cash discount.

A new price list is enclosed, with full details regarding ADC-1 and sensor pricing. You may note that several new products have been added to our line of inexpensive environmental sensors.

After our first year of ADC-1 production, we are pleased to report that the ADC-1 system has found enthusiastic acceptance in nearly all fields of endeavor. Computers equipped with ADC-1 systems are doing everything from monitoring volcanos for eruption precursors to monitoring diaper wetness. They are operating security systems, controlling manufacturing processes, gathering data for wildlife research, and managing energy in new homes. With hundreds now in use worldwide, we stand ready and able to help you with your data acquisition and control projects in almost any field.

Best regards,

Jerry Houston
Marketing Director

REMOTE
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December 3, 1984

Greetings:

Within the past year you've requested and received information on the ADC-1 Data Acquisition and Control System. Since then, RMS has added several new products and expanded its base of installations. Some of the latest information from RMS may suggest new applications for your computer.

As an RS-232 peripheral, the ADC-1 has now been coupled with a wide variety of computers. Software is now available on diskette for many of the computers listed below. We now provide interconnection instructions and sample programs in Appendix A of our Owner's Manual for:

Apple II, Macintosh	IBM PC, PCjr, XT, AT
Atari 400, 800, 1200	NEC PC-8201
Commodore VIC, C-64, Plus/4	Northstar Horizon
DEC Rainbow	Osborne I, Executive
Epson HX-20, QX-10	Radio Shack IV, 2000, CoCo
Heath/Zenith	Radio Shack Portable 100
Hewlett Packard HP-71	TI 99-4A, TI Professonal
Kaypro II, 4, 10	Victor 9000

After nearly two years of ADC-1 production, we are pleased that the ADC-1 System has found enthusiastic acceptance in nearly all fields of endeavor. Computers equipped with ADC-1 Systems are doing everything from monitoring volcanos for eruption precursors to monitoring diaper wetness. They are operating security systems, controlling manufacturing processes, gathering data for wildlife research, and managing energy usage in homes and businesses. With hundreds now in use worldwide, we stand ready and able to help you with your data acquisition and control projects.

Component and labor price increases within the past year resulted in our raising the price of the ADC-1 System to $395 on October 1, 1984. We realize that many of you were not informed in advance of the price change, therefore, we are offering you a special CHRISTMAS SALE.

Those of you receiving this letter will be able to purchase your ADC-1 System at the old price of $369, provided the purchase is made by December 24, 1984. You may order as many ADC-1's as you need at that price, but your check must be received at our office by that date. VISA and Mastercard orders will be accepted by phone until December 24, but be sure to mention that you received this offer from us, as ordinary orders are being processed every day at the current price of $395.

This is our way of showing our appreciation for your interest in our products. Your computer has nearly unlimited potential to accomplish meaningful, real-world tasks with the addition of an ADC-1 to let it communicate with its environment. Why not take advantage of this special opportunity to maximize that potential?

Best wishes for a happy holiday season from RMS!

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SUPPLEMENTAL DATASHEET - SENSORS

We are distributing sensors as a service to our customers. None of the sensors are manufactured by Remote Measurement Systems and all are commercially available. In some cases, you may be able to purchase the sensor directly from the manufacturer at our price. However, we try to stock the various sensors to provide immediate delivery and we do not impose a minimum order amount. The following sensors are currently available from Remote Measurement Systems:

TEMPERATURE

We recommend the use of Analog Devices AD590 which is a two terminal integrated circuit transducer producing an output current proportional to absolute temperature. For supply voltages between +4V and +30V, the device acts as a high impedance, constant current regulator passing 1uA/°C. The range and sensitivity of the sensor is determined by the value of the load resistor which converts current to voltage. Individual AD590 sensors must be calibrated. An accuracy of .1°C is obtainable with a gain and offset correction determined empirically by the user. Remote Measurement Systems has chosen the J grade as providing sufficient accuracy while remaining relatively inexpensive. Higher grades are available with corresponding decreases in absolute error, but with rapidly increasing prices. The price of the J grade AD590 is $7.00 and includes application notes. Temperature measurements are possible with thermocouples when the optional instrumentation amplifier is installed in the ADC-1.

WIND - ROTATING CUP ANEMOMETER

The wind speed sensor suggested by Remote Measurement Systems is a rotating cup anemometer manufactured by Tradewind Instruments. The anemometer mounts on standard 1/2 inch pipe and is made of black lexan. Through the use of a small generator, it produces a millivolt output which is measured directly by the ADC-1. The response with wind speed is linear and a simple equation in the users program produces wind speed from 0 to 100 MPH. Accuracy diminishes below 2 MPH. The price of the anemometer is $45.

ELECTRICAL ENERGY CONSUMPTION

We have located a versatile and easy to use sensor to measure AC current. The Amprobe AC Current transducer A603 has four current ranges(0-5/25/100/250 Amps AC) and produces a secondary current of 0-260uAmp DC which when dropped through a resistor, provides an ideal input to the ADC-1. Though not a true power (watt) sensor, since it does not measure current and voltage simultaneously, it functions well in most home energy management applications. Installation is very simple as the transducer clamp opens to allow placing around one leg of the AC conductor and then springs shut. The AC conductor does not need to be disconnected. For smaller appliances, an Amprobe model A-47L adapter, is available which connects between the appliance and outlet and allows easy clamp-on measurement. When used in combination with the ADC-1 the probe is able to resolve power variations as small as 10 watts over a range of 28000 watts. The Amprobe A603 is available from Remote Measurement Systems at a cost of $75.00.

LIGHT LEVELS

Photovoltaic and photoresistive sensors are available from a variety of electronic distributors. Both sensor types as well as more precise and costly radiometers will function with the ADC-1.

Assistance in locating and applying additional sensor types with the ADC-1 will be provided by Remote Measurement Systems, Inc. New sensors will be added to the list of sensors as they become available.

Price List and Ordering Information
October 1984

ADC-1 Data Acquisition and Control System $395
including enclosure, BSR X-10 transmitter and owner's manual.

Optional Instrumentation amplifier (calibrated at a gain of 10 providing 10 microvolt resolution)	add $ 45
Optional 100ma 6-12 volt DC Power Supply	add $ 15
Without BSR X-10 transmitter	subtract $ 32
Without aluminum enclosure	subtract $ 13

ADC-1 Owner's Manual - if ordered separately $ 15
price deductible from ADC-1 price on subsequent order.

Sensors

Temperature - AD590JH	$ 7
Light Level - photovoltaic cell	$ 6
Wind Speed - WS-1 rotating cup anemometer	$ 45
Wind Direction - WD-1 wind vane	$ 80
Soil Moisture - SMR-1 electronics	$ 56
- w/ gypsum Bouyoucos soil moisture block	$ 69
Relative Humidity - RHT-1 uncalibrated	$ 60
calibrated	$100
Electrical Energy Consumption - A603 AC current transducer	$ 75

Cables

ADC-1 to Computer RS-232 interface cable (computer type and cable length must be specified)	$20 + $0.50/ft.
Sensors:	
AD590JH, Photocell, WS-1 and WD-1	$15 + $0.25/ft.
SMR-1 and RHT-1	$12 + $0.50/ft.

Control Modules - BSR X-10 series

Lamp (300 watt)	$ 20
Appliance (500 watt)	$ 20
Push button wall switch (300 watt)	$ 22

Higher voltage and power capacity remote control modules are available from Leviton. See your local distributor or call RMS for further details.

Software Diskettes $15 to $50

Software diskettes containing BASIC programs to select and read analog inputs, check the status of the digital inputs, and control the outputs and BSR modules are available for the following systems:

Apple Macintosh	IBM PC and PCjr.
Commodore 64	CP/M 8"
Osborne Executive	Kaypro
Epson QX-10	

Prices depend on the extent of the software for the specified computer and vary as new programs are added. Some disks additionally contain graphing, condition setting, and data storage/retrieval routines.

Complete/Customized Systems

Complete data collection systems including computer, ADC-1, sensors and software are available upon request. Please call with your requirements and let us help you construct the system to solve your data collection problems.

Shipping charges for prepaid orders in US: ADC-1 - $5.00
for purchase orders and international: FOB Seattle
Delivery: 1-3 weeks
Terms: Prepaid or 30 days net with purchase order.
Telephone, VISA and Mastercharge orders welcome.

30-day Money-back Guarantee for any reason as long as unmodified and undamaged (minus shipping and 5% restocking charge).
6-month parts and labor warranty on defects in material and workmanship under normal use.

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SENSORS

Virtually any sensor that has a DC voltage or current output can be connected to the ADC-1. Sensors in various grades and price ranges exist for measuring a seemingly infinite list of parameters. Sensor guidebooks are available for those who need to locate manufacturers of sensors to monitor a particular parameter. Remote Measurement Systems has chosen to stock sensors for the most commonly measured environmental parameters. Those sensors listed below are generally the least expensive for measurements of a particular parameter. However, these sensors do have limitations in range and resolution. Sensors with wider applicability are available for each of the parameters, but at a greater cost. Remote Measurement Systems would be glad to assist in locating the appropriate sensor for your application.

TEMPERATURE (Analog Devices)

The AD590JH is a two terminal integrated circuit transducer producing an output current proportional to absolute temperature. For supply voltages between +4V and +30V, the device acts as a high impedance, constant current regulator passing 1 uA/°C. When this current is dropped through a 1 K ohm resistor, 1 mv/°C results and can be measured by the ADC-1. The AD590JH operates over a range of -55°C to +135°C with a resolution of 0.1°C and is contained in a transistor-like metal enclosure. Although individual AD590JH sensors are un-calibrated, corrections can be applied in the software to obtain the desired degree of accuracy. AD590 grades K, L, and M are available with decreasing absolute error, but with rapidly increasing prices.

The ADC-1 can also be used with thermocouples, thermistors, and RTD's.

WIND SPEED (Tradewind Instruments)

The WS-1 is a rotating cup anemometer made of black lexan which produces a millivolt output proportional to wind speed through the use of a small generator. The WS-1 has a starting speed of 6 MPH and generates a linear output of approximately 3 mv/MPH over the range of 6 to 100 MPH. The WS-1 anemometer mounts on standard ½ inch pipe.

WIND DIRECTION (RMS)

The WD-1 monitors wind direction through the rotation of a lightweight plastic vane attached to a precision potentiometer. As the vane orients itself parallel to the wind, the resistance varies and produces a voltage output proportional to wind direction. The sensor is capable of 360° rotation, though the electrical output is 340° (20° "dead spot"). The WD-1 requires only a two conductor cable, mounts on standard ½ inch pipe, and orients itself in winds above 5 MPH.

RELATIVE HUMIDITY (RMS)

Relative humidity is generally an expensive parameter to measure. The RHT-1 from Remote Measurement Systems was designed to provide an inexpensive electronic humidity sensor. The capacitance of a thin gold-plated plastic film sensitive to atmospheric moisture content is measured and converted to a voltage output proportional to relative humidity. Since the plastic will delaminate when exposed to liquid water, the RHT-1 is restricted to use in noncondensing environments, such as building interiors. Individual sensor elements can be calibrated, and the RHT-1 is available in both calibrated (10-90%RH) and uncalibrated versions. The RHT-1 also contains a AD590JH temperature sensor and requires 10 ma @ 5 VDC.

Sensors capable of precision relative humidity measurements over the full 0 to 100% range can easily be interfaced to the ADC-1, although they are more costly.

LIGHT LEVELS

Photovoltaic and photoresistive sensors are the simplest and least expensive devices for monitoring light levels. Remote Measurement Systems distributes a silicon photovoltaic "solar" cell which generates a voltage proportional to light intensity. The cell produces 400 mv in full sunlight and is uncalibrated. For applications where calibration and spectral response are critical, precision solar, IR, and net radiometers are available and function well with the ADC-1.

SOIL MOISTURE/CONDUCTIVITY (RMS)

Measurements of soil moisture or fluid conductivity can be made most simply by measuring the DC voltage drop across an appropriate probe. However when DC voltages are used, polarization effects may occur and create distorted results and probe deterioration. The SMR-1 was designed to prevent this by placing a small AC voltage across the probe. The SMR-1 output is a DC voltage proportional to the conductivity and can be connected directly to the ADC-1. The SMR-1 has an adjustable gain and employs a linear amplifier. When used with a Bouyoucos block, it is ideal for soil moisture measurements. The SMR-1 is not calibrated and requires 15 ma @ 5 VDC (regulated).

ELECTRICAL ENERGY USE (Amprobe)

The Amprobe A603 is a versatile and easy to use sensor for measuring AC current. Though not a true power (watt) sensor, since it does not measure current and voltage simultaneously, the A603 fuctions well in many energy management applications. This sensor has four switch selectable current ranges (0-5/25/100/250 Amps AC) and produces an output voltage which provides an ideal input to the ADC-1. Installation is very simple as the transducer clamp opens to allow placing around one leg of the AC conductor and then springs shut. The AC conductor does not need to be disconnected. When used with resistive loads and 120 VAC power, the A603 is able to resolve power variations as small as 10 watts over a range of 19000 watts.

SECURITY (many)

Any sensor that can be employed with a conventional security system controller can be interfaced to the ADC-1. Door and window magnetic switches, ultrasonic and infrared sensors, and under carpet pressure sensors are among the possible alternatives. Though Remote Measurement Systems can provide you with any of the above, we recommend that you consult with your local security system dealer to determine the best sensor array for your situation.

FUTURE SENSORS (RMS)

Currently under development are sensors for ultrasonic ranging, barometric pressure, and rainfall. Please indicate if you would like further information on these products as they become available.

Assistance in locating and applying additional sensor types with the ADC-1 will be provided by Remote Measurement Systems. Installation instructions, calibrations, and software examples for all of the above sensors are included in the ADC-1 Owner's Manual.

SENSORS

We are distributing sensors as a service to our customers. None of the sensors are manufactured by Remote Measurement Systems and all are commercially available. The following sensors are currently available from Remote Measurement Systems:

TEMPERATURE

The Analog Devices AD590J is a two terminal integrated circuit transducer producing an output current proportional to absolute temperature. For supply voltages between +4V and +30V, the device acts as a high impedance, constant current regulator passing 1μA/°C. The range and sensitivity of the sensor is determined by the value of the load resistor which converts current to voltage. Individual AD590 sensors must be calibrated. An accuracy of 0.1°C is obtainable with a gain and offset correction determined empirically by the user. Remote Measurement Systems has chosen the J grade as providing sufficient accuracy, while remaining relatively inexpensive.

WIND — ROTATING CUP ANEMOMETER

Tradewind Instruments manufactures a rotating cup anemometer which generates a millivolt output that can be measured directly by the ADC-1. The response with wind speed is linear and a simple equation in the user's program calculates wind speeds from 0 to 100 MPH. Accuracy diminishes below 2 MPH.

ELECTRICAL ENERGY CONSUMPTION

A versatile and easy to use sensor for measuring AC current is the Amprobe current transducer A603. It has four current ranges (0-5/25/100/250 Amps AC) and produces a secondary current of 0-260μA DC, which when dropped through a resistor, provides an ideal input to the ADC-1. Though not a true power (watt) sensor, since it does not measure current and voltage simultaneously, it functions well in most home energy management applications. Installation is very simple as the transducer clamp opens to allow placing around one leg of the AC conductor and then springs shut. The AC conductor does not need to be disconnected. When used in combination with the ADC-1, the probe is able to resolve power variations as small as 10 watts over a range of 28,000 watts.

LIGHT LEVELS

Photovoltaic and photoresistive sensors are available from a variety of electronic distributors. Both sensor types, as well as more precise and costly radiometers, will function with the ADC-1.

Price List and Ordering Information
September 1983

ADC-1	$369
Includes table-top enclosure, AC signal transmitter and manual.	
Optional instrumentation amp	add $ 40
Manual (if ordered separately)	$ 8
Software diskette (listed in manual)	$ 15
Sensors	
Temperature — Analog Devices 590JH	$ 7
Wind speed — rotating cup anemometer	$ 45
Light levels — photovoltaic cell	$ 6
Electrical Energy Consumption — Amprobe A-60F	$ 75
Magnetic switches	$ 7
Control modules — BSR	
Lamp (<300W)	$ 20
Appliance (<500 W)	$ 20
Wall switch (<300 W)	$ 20
220v appliance or water valve	call

Custom systems integration and installation quotes available on request.

Shipping: $5.00 (USA); $20 for overseas air.
Delivery: 1-3 weeks.
Terms: Prepaid or 30 days net with purchase order. ←
Telephone, VISA and Mastercharge orders welcome.

30-day Money-back Guarantee for any reason as long as unmodified and undamaged (minus shipping and 5% restocking charge).
6-month parts and labor warranty on defects in material and workmanship under normal use.

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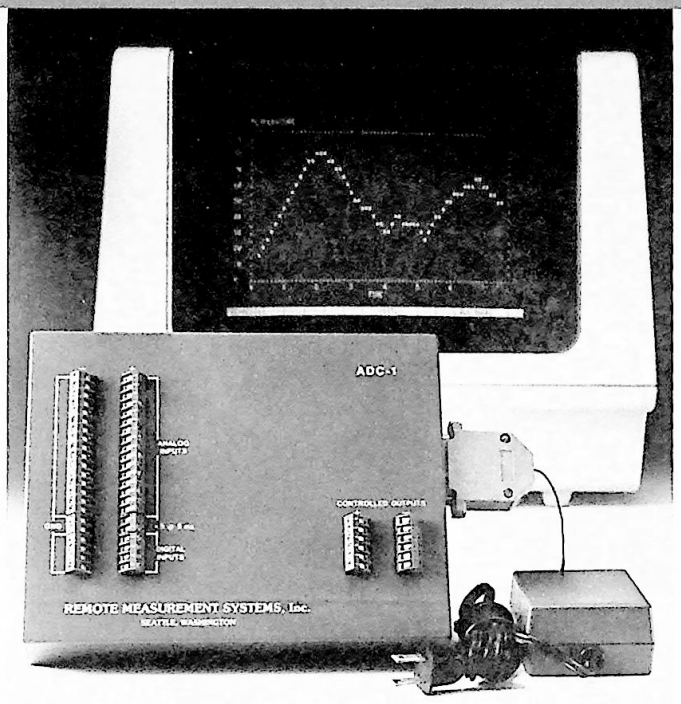


TAKE CONTROL WITH THE

ADC-1

The Measurement, Monitoring and Control System

The ADC-1 from Remote Measurement Systems is a sophisticated yet easy-to-operate data acquisition and control system designed for use with personal computers.

It expands the functions of the personal computer by combining high resolution measurement capabilities with the ability to control external devices. Designed as a peripheral unit, the ADC-1 allows you to link a wide array of sensors with your computer to gather both analog and digital information from the environment.

By attaching control modules to the computer, the ADC-1 lets you use the computer for scientific data collection, process control and energy management tasks—without requiring extensive electronics experience or great expense.

This system can be used with any personal computer with an RS-232 serial interface.

HERE'S WHAT THE ADC-1 AND YOUR COMPUTER CAN DO FOR YOU:

Enable you to collect analog data from your environment. Variable conditions such as temperature, energy consumption and light intensity can be routinely monitored from sensors that emit analog signals. These signals are then converted to digital values by a 12-bit analog-to-digital (A/D) converter.

Help you gather and measure digital information from your surroundings. For example, signals from security system sensors or optical encoders can be relayed to the computer via the ADC-1 digital inputs.

Let you use your personal computer to evaluate this data and react by directing the ADC-1 to control external devices. The six direct-wire controlled outputs are used to activate solid state relays or other low voltage electronic equipment. In addition, lamps, appliances and other AC-powered devices can easily be controlled by the ADC-1 through its line carrier transmitter. Remote control modules are inserted between the device and the AC outlet and are activated through codes sent over the household wiring by the ADC-1.

Permit you to employ one system for home, office and laboratory. Unlike many peripherals which are designed to work only with a certain machine or operating system, the ADC-1 is truly portable, it will operate with any personal computer that has an RS-232 serial port. While your computer system needs may vary with the tasks you wish to accomplish in either the home or office, you only need one type of data acquisition and control system—the ADC-1 from Remote Measurement Systems. Since the ADC-1 is not computer specific, it can be used with your next computer if you decide to upgrade your system.

Provide more application flexibility. RS-232 compatibility allows you to connect the ADC-1 directly with a modem for remote site data collection, thus broadening your potential uses for the system. Positioning the ADC-1 remotely from the computer also reduces sensor lead lengths.

Allow you to operate under a variety of program languages. The ADC-1 runs under any language that controls an RS-232 serial port, including BASIC, FORTRAN, Forth, Pascal and assembly language. A BASIC program to read inputs, control outputs and plot data on a terminal is listed in the ADC-1 owner's manual. Specific implementation instructions are included for the Apple,® Osborne,® Atari,® Commodore,® Northstar,® Epson,® Radio Shack® and IBM-PC® computers.

Let you use a simple command structure to monitor, measure and control simultaneously. Commands to the ADC-1 are initiated by transmission of a single 8-bit byte through the serial port. (Hardware handshaking is not required.) For each byte transmitted, the ADC-1 returns an 8-bit byte which provides status and measurement data. Since each section of the ADC-1 functions independently, it may continue to control direct wire outputs or monitor digital inputs while the A/D converter or line carrier transmitter is busy.

Give you the best system available for a personal computer. The ADC-1 from Remote Measurement Systems gives you everything you need in a data acquisition and control system. The versatile ADC-1 contains both the analog-to-digital and control capabilities required to perform such tasks—at surprisingly low cost. While data acquisition and control systems have been used in industry for many years, traditionally they have been tied to larger, more costly computers. Now Remote Measurement Systems gives you an excellent alternative—a flexible yet moderately-priced system that runs on the personal computer.

Can you afford to wait any longer for the superior data acquisition and control system? Order your ADC-1 today from Remote Measurement Systems.

REMOTE MEASUREMENT SYSTEMS, INC.

ADC-1 FEATURES AND SPECIFICATIONS

16 Analog to Digital Inputs
- ► Integrating dual slope A/D with conversion at 14 Hz. (100 Hz. with clock speed jumper and two capacitor changes)
- ► 12 bit (plus sign) A/D provides resolution of one part in 8192 (0.1 mV sensitivity).
- ► Input Range is ± 0.4 volts (modifiable to ± 2.0 volts)
- ► Optional instrumentation amplifier allows microvolt sensitivity for one bank of 8 inputs.
- ► Onboard temperature sensor for use with thermocouples.

4 Digital Inputs
- ► 2 modes—toggle or latched
- ► Maximum sample rate @ 9600 baud is 400 Hz.
- ► Functions for both normally open and normally closed circuits.

AC Line Carrier Remote Device Control
- ► Sends signals over normal household/office AC wiring to control 32 independent devices using BSR, Leviton, Sears or Radio Shack remote control modules.
- ► 8 house codes are switch selectable to reach 256 possible units.

6 Direct Wire Digital Ouputs
- ► Latched TTL levels with maximum current of 50 mA.
- ► Connect directly to solid state relays.

Attaches to the RS-232 or serial interface of most computers or modems.
- ► 6 user-selectable baud rates—300, 600, 1200, 2400, 4800, 9600.
- ► Uses three wires from standard DB-25 connector for easy installation on your system.
- ► Word length—8 bits; 1 or 2 stop bits.
- ► Additional units—For applications where 16 analog inputs are not sufficient, multiple ADC-1 units may be connected to the same RS-232 serial port and selected with an enable line.

Software
- ► The Owner's Manual contains listings of the four subroutines needed to operate all ADC-1 features. These subroutines are written in BASIC, are less than 20 lines in length, and are easily incorporated into your applications program.
- ► Specific interconnection instructions and subroutines are included for IBM-PC, Apple, Osborne, Atari, Commodore, Northstar, Epson, Victor and Radio Shack computers.

Dimensions
- ► Desktop unit—8×7×2 inches, aluminum enclosure.
- ► AC signal transmitter—3.5×2.5×1.5 inches.

Weight
- ► 3 lbs.

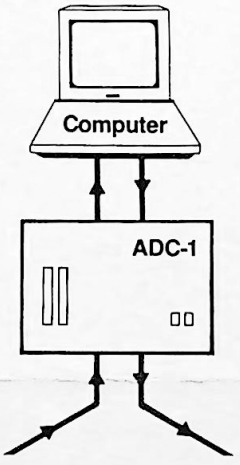
System Requirements
- ► RS-232 serial port.
- ► Personal computer—(Since the ADC-1 does not contain a microprocessor, it is controlled by the computer to which it is attached.)

Power
- ► CMOS technology is used throughout for current consumption of less than 20mA @ 5 v. or 35mA @ 12 v; requires power to be supplied by host computer.

Sensor Installation
- ► The ADC-1 comes with a terminal strip that requires only a screwdriver for easy connection of sensors.

ADC-1 USER APPLICATIONS

- ► Measure the electrical energy consumption of your home or appliances. If consumption exceeds a specific limit, your computer can alert you or even automatically reduce the load. The price of the system could be paid for in a short time via lower electrical bills. Compare our price with a commercial wattmeter!
- ► Connect your security system to the ADC-1 for sophisticated alarm responses. It can activate specific lights or a siren in a pattern that reflects the location and magnitude of the intrusion.
- ► Operate a remote cabin from your primary residence. In seconds, via the telephone and a modem, you will know the status of the doors, windows, river level, and weather at your second home. Turn the furnace on before you plan on arriving!
- ► Monitor soil moisture of indoor plants and outdoor gardens. Use your computer to control garden watering or irrigation systems.



Inputs	Outputs
Security	Siren
Light	Lamp
Energy	Heater
Moisture	Pump/Valve
Temperature	Air Conditioner

Uses limited only by your imagination.

- ► Collect data and control scientific experiments in the laboratory. The ADC-1 offers low power consumption, small size and modem connection capability—features that make it ideal for remote site data collection.
- ► Build your own weather station with data storage and graphic displays of temperature, wind speed, pressure, and rainfall.
- ► Teach your students how computers are used in measuring and controlling processes in industry and let them invent their own uses in the school or home.
- ► Experiment with robotics sensors and motor control.
- ► Use the ADC-1 to control a star-tracker for your telescope or rotate solar panels to follow the sun (adds 35% to energy collected).

For pricing and ordering information contact:
Remote Measurement Systems, Inc.
P.O. Box 15544,
Seattle, WA 98115
(206) 525-3369

REMOTE MEASUREMENT SYSTEMS, INC.

REMOTE MEASUREMENT SYSTEMS

Presents the ADC-1

An inexpensive measurement, monitoring and control system

The ADC-1 is a data acquisition and control system for the home or office computer which adds a new dimension to personal computer uses. The host computer employs the ADC-1 to monitor a variety of sensors and gather information from the surrounding environment. In response to user defined conditions, the computer evaluates these inputs and reacts by directing the ADC-1 to control external devices.

Computers have been used for process control and energy management in industry for many years. **Remote Measurement Systems, Inc.** now offers the ADC-1 to extend these capabilities to the personal computer user. Sensors for measuring such items as temperature, security system status, or energy consumption are connected with a screwdriver to the terminal strip on the tabletop enclosure of the ADC-1. Control of external devices is achieved by simply plugging in AC control modules and issuing two character commands from your computer. Sophisticated data collection and command capabilities are possible for users without expert electronics experience.

The ADC-1 has been designed by **Remote Measurement Systems, Inc.** with a number of options which make the ADC-1 both versatile and adaptable. The choice of a 12 bit analog to digital converter permits .02% resolution in applications where 8 bit resolution is insufficient. The communications interface supports both standard RS-232 as well as the TTL levels used by the Atari and Commodore (VIC-20/64) serial ports. Baud rates are switch selectable. Low power consumption, which is achieved by the use of CMOS technology, permits the siphoning of power from the host computer or modem. Each digital input can be configured for either normally open or normally closed operation in latched or toggle modes.

External device control is achieved by either direct wire TTL outputs or through signals sent over existing AC wiring to plug-in control modules. Commands to the ADC-1 are initiated by transmission of a single 8 bit byte through a serial port. Hardwire handshaking is not required. For each byte transmitted, the ADC-1 returns an 8 bit byte which provides status and measurement data. While the A/D converter or BSR transmitter is busy, the ADC-1 may continue to control direct outputs or monitor digital inputs.

Operation is possible under many languages including Basic, Fortran, Pascal or assembly language. Software to read inputs, command outputs, and plot data on the terminal is included in the ADC-1 owners manual. Diskettes for specific computer systems may be purchased at a nominal charge.

With the ADC-1, a whole new world of computer applications becomes available. By using the ADC-1 to link sensors and control modules with the computer, the user is free to concentrate on sensor array design and applications. The home or office in which a computer controls temperatures, monitors security and energy consumption, and performs non-mobile task, is not an idea for the future but is here now!

The ADC-1 offers the following features:

- **16 Analog to Digital Inputs**
  - Integrating dual slope A/D with conversion at 7 or 14 Hz. (30 Hz. with clock speed jumper and two capacitor changes)
  - 12 bit (plus sign) A/D provides resolution of one part in 8192 (0.1 mV sensitivity).
  - Input Range is modifiable from ±-0.4 volts to ±-2.0 volts
  - Optional instrumentation amplifier allows microvolt sensitivity for one bank of 8 inputs.
- **4 Digital Inputs**
  - 2 modes — toggle or latched.
  - Maximum sample rate @ 9600 baud is 400 Hz.
  - Functions for both normally open and normally closed circuts.
- **6 Direct Wire Digital Outputs**
  - Latched TTL levels with maximum current of 50 mA.
  - Connect directly to solid state relays.
- **AC Line Carrier Remote Device Control**
  - Sends signals over normal household/office AC wiring to control 32 independent devices using BSR, Leviton, Sears or Radio Shack remote control modules.
  - 8 House codes are switch selectable to reach 256 possible units.
- **Attaches to the RS-232C or serial interface of most computers or modems.**
  - 6 User selectable baud rates — 300, 600, 1200, 2400, 4800, 9600.
  - Uses three wires from standard DB-25 connector for easy installation on your system.
  - Word length — 8 bits; 2 stop bits.
- **Transferable** — Since the ADC-1 is not computer specific, it can be used with any system and will function with your next system if you upgrade.
- **Portable** — The ADC-1 will connect directly with a modem for remote site data collection.
- **Extreme low power** — CMOS technology used throughout for current consumption of less than 20mA @ 5 v. or 35mA @ 12 v.
- **Dimensions**
  - Desktop unit — 8x7x2 inches, aluminum enclosure.
  - AC signal transmitter — 3.5x2.5x1.5 inches.
- **Weight** — 3 lbs.

APPLICATIONS

- Build your own weather station with data storage and graphical displays of temperature, wind speed, pressure, and rainfall.
- Connect your security system to the ADC-1 for sophisticated alarm responses. Activate lighting upon sensing an intruder in your yard, while reserving a siren for an actual break-in.
- Use the ADC-1 to control a star-tracker for your telescope or rotate solar panels to follow the sun (adds 35% to energy collected).
- Measure the electrical energy consumption of your home or appliances. If consumption exceeds a specific limit, your computer can alert you or even automatically shed part of the load. The price of the system could be paid for in a short time via lower electrical bills. Compare our price with a commercial wattmeter!
- Operate a remote cabin from your primary residence. In seconds, via the telephone and a modem. you will know the status of the doors, windows, river level, and weather at your second home. Turn the furnace on before you plan on arriving!
- Show your children how rapidly the freezer temperature rises on opening the door. Aid your child's introduction to computer uses by creating novel exploratory applications.
- Monitor soil moisture of indoor plants and outdoor gardens. Use your computer to control garden watering or irrigation systems.
- Sensors soon to be available will allow heart rate and blood pressure to be measured and plotted.
- Experiment with robotics sensors and motor control.
- Teach your students how computers are used in measuring and controlling processes in industry and let them invent their own uses in the school or home.
- Collect data and control scientific experiments in the laboratory. The low power, small size, and ability to connect with a modem are ideal features for remote site data collection.

USES LIMITED ONLY BY YOUR IMAGINATION!

Price List and Ordering Information

ADC-1	$329.
ADC-1 with instrumentation amp	$369.
Includes table-top enclosure, AC signal transmitter and manual.	
Manual (if ordered separately)	$ 8.
Software diskette (listing in manual)	$ 15.
Sensors	
Temperature — Analog Devices 590JH	$ 7.
Wind speed — rotating cup anemometer	$ 45.
Light levels — photovoltaic cell	$ 6.
Electrical Energy Consumption — Amprobe A-60F	$ 75.
Magnetic switches	$ 7.
Control modules — BSR	
Lamp (<300W)	$ 20.
Appliance (<500 W)	$ 20.
Wall switch (<300 W)	$ 20.
220v appliance or water valve	call.

Custom systems integration and installation quotes available on request.

Shipping: $5.00 (USA); $20 for overseas air.
Delivery: 2-4 weeks.
Terms: Prepaid or 30 days net with purchase order.
Telephone, VISA and Mastercharge orders welcome.

30-day Money-back Guarantee for any reason as long as unmodified and undamaged (minus shipping and 5% restocking charge).
90-day parts and labor warranty on defects in material and workmanship under normal use.

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